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ABSTRACT

One component of the Maryland School Performance Assessment; Program (MSPAP) is the state's performance-based assessments, criterion-referenced tests that require students to apply what they know and can do to solve problems and display other higher-order thinking skills. This document helps parents, teachers, students, and other citizens understand the tasks of the MSPAP. "Salinity" is a science and language usage task for fifth graders, one of nine tasks selected to demonstrate the MSPAP. Actual operational task materials are presented. The "Answer Book" contains questions and directions for students and space for students to record their answers. The task is an investigation of how a hydrometer can be used to measure the different levels of saltiness in water samples. A group of four students constructs a hydrometer and uses it to test water samples. Answers are recorded individually. The "Resource Book" contains a map of the Chesapeake Bay, and the "Examiner's Manual" contains instructor preparation activities and directions for students. (SLD)

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MSPAP
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Salinity

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Grade 5

Science
Language Usage

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Maryland State Department of Education
July 1994

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INTRODUCTION

Background and Purpose of This Document

Maryland public schools have embarked on an important mission: to "re-form" and improve Maryland public schools so that all children can learn, attend schools in which they can progress and learn, and have a real opportunity to learn equally rigorous content. The Maryland State Department of Education launched the Maryland School Performance Program, its strategy for improving public education, in 1989. One component of the Maryland School Performance Program is the state's performance-based assessments, often referred to as the "CRTs" (for criterion-referenced tests). These assessments require students to apply what they know and can do to solve problems, reason, explain, recommend, and display other "higher order" thinking skills. These assessments are officially called the Maryland School Performance Assessment Program (MSPAP).

The primary focus of MSPAP is *school performance*. However, individual student scores from MSPAP are also available. MSPAP assessment tasks assess student performance in grades 3, 5, and 8 in relation to the Maryland Learning Outcomes. These outcomes focus on what students should know and be able to do in reading, writing, language usage, mathematics, science, and social studies. MSPAP tasks and the learning outcomes they assess are sometimes confused with "outcome based education," an approach to teaching, learning, and managing schools which has its share of supporters and detractors. The purpose of this document is to help parents, teachers, students, and other Maryland citizens understand what MSPAP tasks are like.

This Document

This document contains information and materials related to one of nine operational MSPAP tasks that have been selected for public release. These nine tasks were selected to illustrate the types of activities, questions, and responses that MSPAP requires of students.

Contained in this document are actual operational test materials, including:

- *Student Response Book/Answer Book:* Contains questions and other directions to students and space for students to enter their responses.
- *Student Resource Materials Book/Resource Book:* Contains background reading and other information. Only some tasks require such background material.
- *Manipulatives:* Additional materials necessary for tasks (e.g., spinners for the mathematics task "School Fair").
- *Examiner's Manual:* Contains directions to teachers who administer MSPAP, including the directions they read to students verbatim.

Information on scoring these tasks is available in the *Scoring Guide — Introduction, Scoring Tools, and Sample Responses*. This document explains how student responses to the MSPAP are scored. It also contains criteria used to score student responses and sample student responses to all assessment activities in the task.

As you examine this document you will quickly see the complexity of the materials related to each MSPAP assessment task. Because of this complexity, MSDE distributes these tasks at the request of citizens only in conjunction with a brief guided presentation of the materials by an MSDE or local school system educator.

We hope you find the materials interesting and informative. We also expect that you will recognize the power that assessments like MSPAP have for guiding and goading improvements in school performance and student learning and for raising standards for performance for all Maryland public schools.

ANSWER BOOK

Thursday, Task 2
Title: Salinity

INTRODUCTION

Earth is a unique planet of the solar system in that it supports conditions that are necessary for life. One of the basic conditions necessary for life to occur is water. Over 70 percent of our planet is covered with fresh or salt water. Different organisms are found in each of these environments. The Chesapeake Bay is an environment where fresh water from rivers and streams combines with the salty Atlantic Ocean water. This mixture of salt and fresh water creates a solution known as "brackish water."

Today you will investigate how a hydrometer can be used to measure the different levels of saltiness (salinity) in water samples. You will also decide how the hydrometer could be used to establish the correct salinity for an aquarium.

You will have 42 minutes to complete Activities 1 through 7. Refer to the task summary table on the chalkboard; it tells you how much time is suggested for working as a group or as an individual.

1 Building the hydrometer

Groups of four students

Your group will be constructing a hydrometer. A hydrometer is a device that can be used to measure the differences in saltiness between several water samples. To make this tool, your group will need to collect the following materials from the Materials Center:

- one 4-inch piece of a clear drinking straw
- a small amount of clay
- two BBs

Follow these directions to build a hydrometer for your group to use in the next activity:

1. Cut the straw in half so that you have two pieces of equal length. Set one half of the straw aside. It will not be used.
2. Flatten the clay so that it is about 1" x 1/4".
3. Push the cut straw into the clay so that one end of the straw is sealed. Set the excess clay aside.
4. Carefully drop the two BBs into the open end of the straw. Your group has constructed a home-made hydrometer. Your hydrometer should look like the one on the left. You will use it in the next activity.

2 Investigating salinity

Groups of four students

Your group will use the hydrometer to test the saltiness of different samples of water. Your teacher has prepared water samples for you to test. Be sure to label the samples immediately so that you know which is fresh water and which is salt water. Gather the following materials from the Materials Center:

- 1 cup of fresh water
- 1 cup of salty water
- 3 empty cups
- paper towels (just in case . . .)
- 1 ruler
- 1 thin-line permanent marker
- masking tape

Read and follow the directions very carefully.

Step A Label the two water samples. Place the hydrometer (clay end down) in the fresh-water sample and release it. Observe what occurs. If the hydrometer should leak, remove it from the water and re-seal it with the clay. Draw and label your observations in a picture that shows the hydrometer floating in the fresh-water sample.

Step B Place the hydrometer in the salt-water sample and observe what occurs. Draw and label your observations in a picture that shows the hydrometer floating in the salt-water sample.

Step C In your group, decide on a way to quantitatively measure the level at which the hydrometer floats in fresh water. Write a description of your group's method of measurement.

Step D Using the method of measurement your group decided on, measure and record the level at which the hydrometer floats in the salt-water sample. Record your results below.

Now measure and record the level at which the hydrometer floats in the fresh-water sample. Record your results below.

Step E

Describe any differences between the two water samples that you observed.

Step F

What are some reasons that might explain any observed differences between the salt and fresh water?

3

In a moment you will be mixing equal amounts of fresh and salt water together. Before you do this, think about the hydrometer and the way that it floated in the previous two samples. Predict how the hydrometer might float in the mixture of fresh and salt water. Write your prediction below. Be sure to give a reason for your prediction.

4 Groups of four students

Step A Working with your group, pour one half of your fresh-water sample into an empty cup and an equal amount of your salt-water sample into a second empty cup. Mix the two water samples together in a third cup and test the mixture with your hydrometer. Record your observations and measurements below.

Step B Did your investigation cause you to accept or reject the prediction you made? Explain why, using evidence from your investigation.

5 You have just completed an investigation that involved water with different salinity values. In the next activity you will use this information to solve some problems that might occur when you are keeping animals and plants in an aquarium.

In the Chesapeake Bay, salinity determines the types of animals and plants that can survive in a particular zone. Some types of fish can only be found in areas that have a certain amount of salt in the water. Salinity can be measured in parts per thousand, or "ppt." Higher ppt measurements indicate greater salinity.

Step A

The chart below represents several species of organisms that are common to the bay. It also includes the range of salinity in which the organisms can live. Open your Resource Book to page 10 and use the map of the Chesapeake Bay and the chart below to complete the last column in the chart.

SALINITY SURVIVAL ZONES

Organism	Salinity Range	Zones Where the Organism Can Be Found
Blue Crab	0–30 ppt	
Black Sea Bass	15–30 ppt	
Sea Nettle	7–30 ppt	
White Crappie	0 ppt	
Striped Bass	0–30 ppt	
Common Sea Star	18–30 ppt	
Marsh Periwinkle	0–15 ppt	
Waterweed	0–9 ppt	
Yellow Pond Lily	0 ppt	

Step B

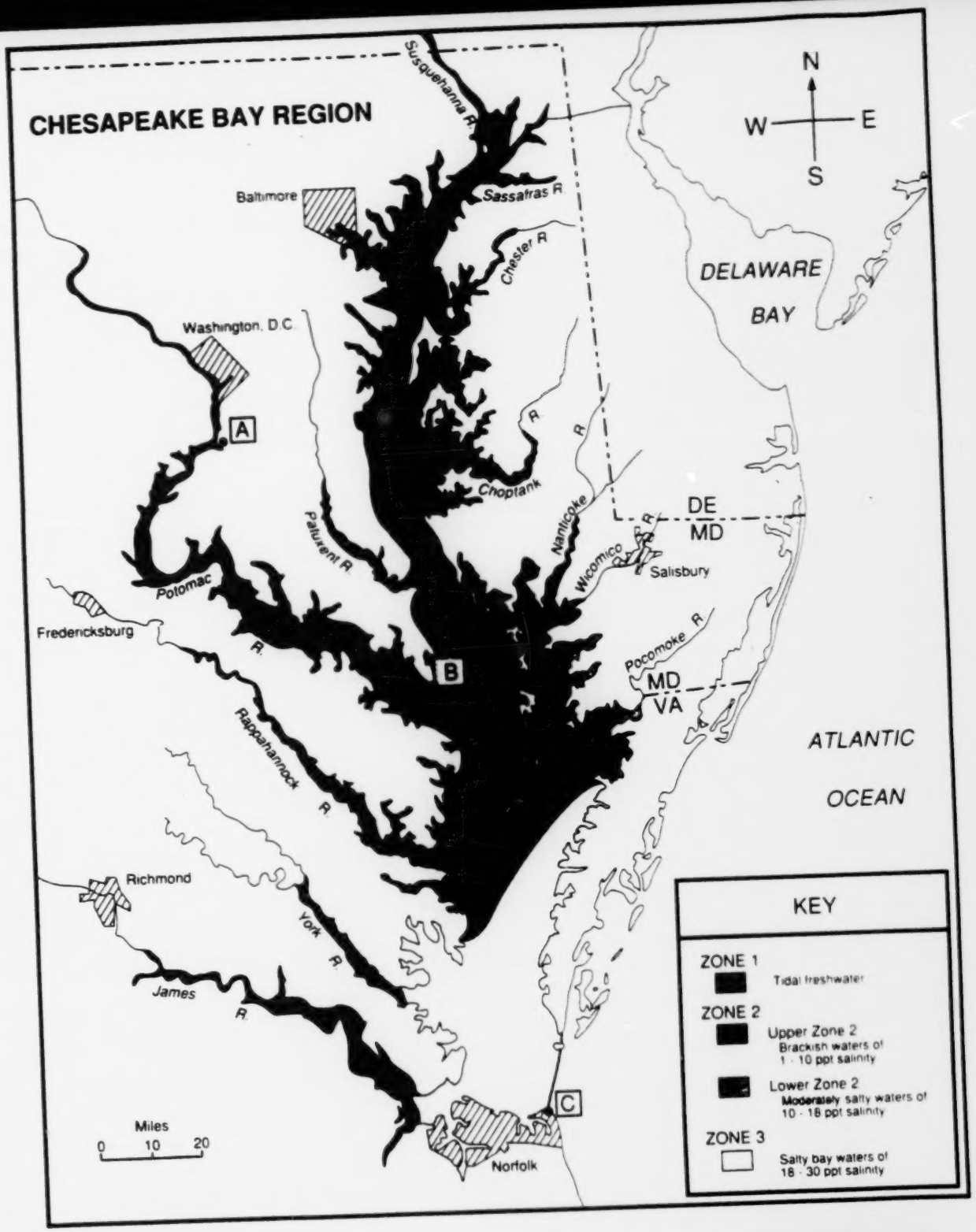
The salt-water aquarium in your school has a salinity range of 16 to 30 ppt. From the list of organisms above, identify the plants or animals that would NOT be able to survive in the aquarium and explain your reasons for not including these organisms. Write your answer below.

6 On a recent field trip to the Chesapeake Bay, your class caught several small black sea bass for the school aquarium. Write a paragraph for your teacher describing how you could use the hydrometer to make sure that these fish stay alive. Use observations and data from what you did today to help you write your response below.

7 Draw a circle around the number below that shows how easy or how hard it was for you to complete the activities in this task.

1	2	3	4	5
Very easy	Somewhat easy	About average	Somewhat hard	Very hard

RESOURCE BOOK



STOP.
Turn to page 37 in your Answer Book.

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EXAMINER'S MANUAL

Thursday

Secure information pertaining to other tasks

has been removed from this area.

Task 2 Title: Salinity

Total testing time for this task, beginning with oral directions, is **45 minutes.**

Copy the following task summary table onto the chalkboard.

Activity	How Students Work	Suggested Time (Minutes)
1	Group of 4	3
2	Group of 4	15
3	Individual	5
4	Group of 4	5
5	Individual	7
6	Individual	6
7	Individual	1

MATERIALS/EQUIPMENT NEEDED, LISTED BY ACTIVITY

Activity 1
For each group of four students:

- one 4-inch section of a clear drinking straw
- a small amount of modeling clay, about the size of a regular marble
- two copper BBs, plus extras if students drop theirs

Activities 2 and 4
For each group of four students:

- three 12-oz clear plastic cups (empty)
- one metric ruler
- one thin-line permanent ink marker
- masking tape
- paper towels
- one 12-oz clear plastic cup containing 10 oz of salt water
- one 12-oz clear plastic cup containing 10 oz of fresh water

TEACHER PREPARATION

Prepare a plan for grouping the students in groups of four.

Before administering the task, prepare 1 gallon of salt water according to the following recipe:

- 4 cups of kosher or canning salt
- $\frac{3}{4}$ gallon of water from the tap

Mix salt and water in an empty one-gallon container. Close the top. Shake vigorously. If there is salt left on the bottom, you have made it correctly.

Setting up for the test:

Shake the container of water. Pour approximately 10 oz of the salt water into the clear plastic 12-oz cups. Supply enough water for each group of four students. Do the same with the fresh water. Have supplies set in a Materials Center for the students to get during test administration. Place these in an area labeled "Salt Water Cups" or "Fresh Water Cups." Students will take cups from this area.

SAY **Open your Answer Book to page 32 and follow along as I read aloud.**

Allow time for the students to locate the correct page.

SAY **INTRODUCTION**

Earth is a unique planet of the solar system in that it supports conditions that are necessary for life. One of the basic conditions necessary for life to occur is water. Over 70 percent of our planet is covered with fresh or salt water. Different organisms are found in each of these environments. The Chesapeake Bay is an environment where fresh water from rivers and streams combines with the salty Atlantic Ocean water. This mixture of salt and fresh water creates a solution known as "brackish water."

Thursday

SAY **Today you will investigate how a hydrometer can be used to measure the different levels of saltiness (salinity) in water samples. You will also decide how the hydrometer could be used to establish the correct salinity for an aquarium.**

You will have 42 minutes to complete Activities 1 through 7. Refer to the task summary table on the chalkboard; it tells you how much time is suggested for working as a group or as an individual.

Write the remaining testing time on the chalkboard at appropriate intervals.

Secure information pertaining to other tasks

has been removed from this area.